Migdal measurement in CYGNO: Status

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Neutron source: FNG?

Neutron spectrum (~ isotropic):

14 MeV - 10^{11} n / s
2.5 MeV - 10^8 n / s

Minimal distance from the center of interaction: 4 mm

Useful numbers:

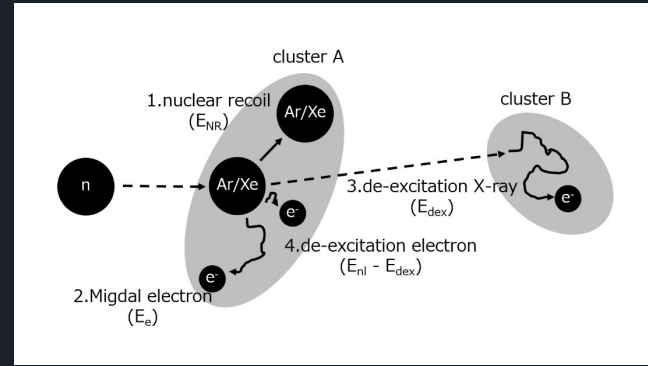|	
AmBe spectrum:	1-10 MeV - 2.2×10^5 n / s
Migdal BR for Argon:	$f(E_n) * 7.2 \times 10^{-5}$
Fluorescence yield (K shell, Ar):	0.14
Solid Angle/4π @ 50 cm for 20x20 cm^2 TPC:	1.27 %
Solid Angle/4π @ 10 cm for 20x20 cm^2 TPC:	31.8 %

arXiv:1707.07258
arXiv:2009.05939

$$f(E_n) = \left(\frac{q_e}{511\,\text{eV}}\right)^2 = \left(\frac{1}{511\,\text{eV}}\right)^2 \frac{2m_e^2 E_R^{max}}{m_T} = \left(\frac{1}{511\,\text{eV}}\right)^2 \frac{2m_e^2}{m_T} \frac{4m_n m_T}{(m_n + m_T)^2} E_n$$

Google sheet with more infos here.

$f(E_n = 14\,\text{MeV}) = 72.4$
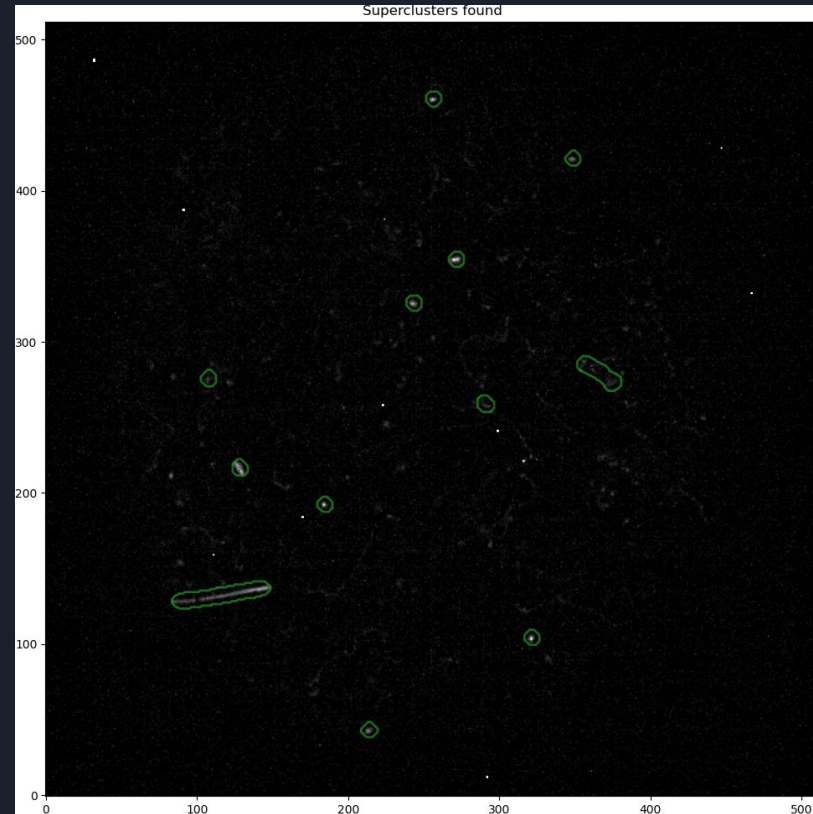$f(E_n = 2.5\,\text{MeV}) = 12.9$

O(3000 ev/day) @ 265 cm

Can the old data from LEMOn tell us something?

In these days we are looking at the old runs performed @ FNG, in particular run 815.

We installed and run the reconstruction code available on github.

We are trying to understand what are the 'observables' to look at: any suggestion?

Superclusters found

Simulation

In the last week we talked with Giulia to understand if there is the possibility to set up a simulation with the aim of have a more complete comprehension of the detector behaviour.

The conclusion was that as a first step one could simulate a monochromatic neutron beam (together with a monochromatic X-ray beam) with a ~ 10 cm thick lead shielding.

However I must still look at the Geant4 code following the instruction I got from Giulia.

To conclude:

We are working in parallel on the various aspects of the problem to truly understand the feasibility of a Migdal measurement with the CYGNO apparatus.